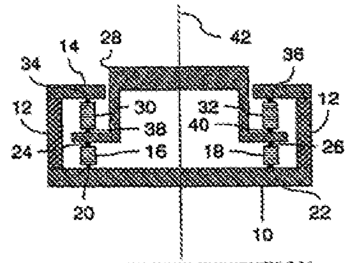
REMARKS

Responsive to the Office Action mailed 4-03-09 Applicant submits that Claims 10, 11, 13, 15-19, and 21-25 remain in the application. As understood, and in view of the non-entry of Applicant's proposed amendments to the claims dated 6-24-08, it appears that prior to this response, the claims stood as amended on 12-12-07. Accordingly, this response proceeds on that assumption. In this Response, Claims 10, 11, 13, 15-17 have been amended herein only as to form. As now presented. Independent claim 10 recites:

> 10. An interface for reducing mechanical vibrations, comprising:
>
> a base connection element (10),
>
> a load connection element (28),
>
> at least one support element (14),
>
> at least a first energy converter system (16, 18) extending between at least one engagement point (20, 22) located on the base connection element (10) and at least one engagement point (24, 26) located on the load connection element (28);
>
> at least one second energy converter system (30, 32) extending between at least one engagement point (34, 36) located on the support element (14) and at least one engagement point (38, 40) located on the load connection element (28); and
>
> at least one elastic pretensioning device (12) connecting said base connection element (10) to said support element (14) for exerting a compressive preload on the first energy converter system (16, 18) <u>and</u> on the second energy converter system (30, 32), said pretensioning device (12) being embodied as <u>an elastic pipe which surrounds the energy converter systems (16, 18, 30, 32)</u>;
>
> wherein the load connection element (28) has a first part located in an intermediate space between the base connection element (10) and the support element (14), and a second part located outside the intermediate space between the base connection element (10) and the support element (14).



PRESENT INVENTION

In further clarification of the recited “pretensioning device 12”, a better understanding thereof may be obtained by referring to the perspective view (Fig. 8) of the alternative embodiment illustrated in Fig. 7. Note that in both embodiments the pretensioning device (12), an elastic pipe, surrounds the energy converter systems which in this latter embodiment are designated 130 and 136.

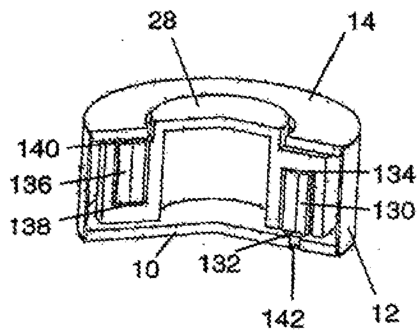


Fig. 8

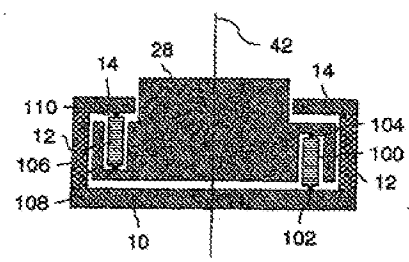


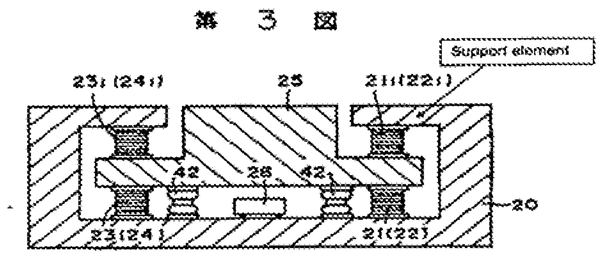
Fig. 7

PRESENT INVENTION

The claim set out above has been referenced to Applicant’s Drawing Fig. 2 for the convenience of the Examiner. The other independent claim, Claim 18, is similar. No limitation of the true scope of any claim is intended by this specific reference to the embodiments of Fig. 2 and 7-8.

Claims 10, 11, 13, 15-19, and 21-25 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Katsumi in view of Holland et al.

Katsumi discloses a relevant vibration suppressing apparatus including a load connection element 25 captured within a rigid support structure 20 and suspended therefrom by a plurality of piezoelectric elements 21-24.



KATSUMI

As was correctly pointed out in the Office Action "Katsumi lacks the elastic pipe surrounding the actuators as claimed".

However, Applicants' claims do not merely recite "an elastic pipe" 12, but in fact recite "an elastic pretensioning device that is embodied as an elastic pipe which surrounds the energy converter systems". Not only does the elastic pipe surround the energy converter systems, it also (a) connects the recited support element 14 to the recited base element 10, and (b) exerts a compressive preload on the first and second energy converter systems (16, 18 and 30, 32 in the embodiment of Fig. 2). Katsumi clearly does not suggest the application of a compressive preload to his corresponding elements 21(22), 23(24).

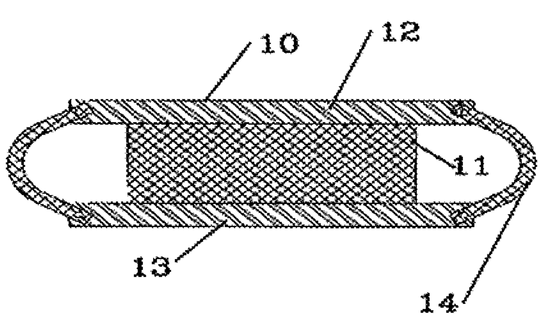


Fig. 1

HOLLAND ET AL

The cited Holland et al patent does not relate to an active vibration suppression apparatus of the type disclosed by Katsumi, or that now claimed by Applicant, and instead relates to a passive seismic isolation bearing assembly of the type used to support heavy structures.

A careful reading of the Holland et al patent reveals that the "tension damping device" 14 shown in Fig. 1 is not a pre-tensioning device performing functions of the type claimed by Applicant; namely, applying a compressive pre-load across "energy converter systems", nor is the element designated 14 an elastic pipe surrounding energy converter systems. Instead, as depicted in Fig. 8 of the reference, the element 14 is one of a plurality of elongated translation limiting devices (TDD's) strung across the edges of a laminated heavy duty load bearing member 11 of the type used to support large building structures and the like.

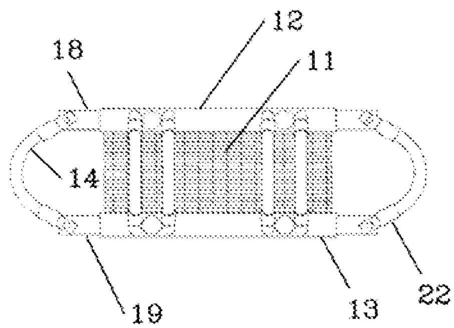


Fig. 8

Their purpose is to limit the permissive distortion or deformation of the bearing member, i.e., shearing force dislodgements (of the plates making up the bearing member 11) occurring between the constituent laminated structure. As described in the reference, should a seismic event cause horizontal motion of the supporting surface beneath a building supported by one of the Holland et al bearing assemblies, the flexible straps or tubes 14 will extend and perhaps ultimately reach their length limit where they are placed in tension and stretched to their elastic limit as the associated bearing member is deformed. Holland et al illustrates such function in their Drawing Fig. 5.

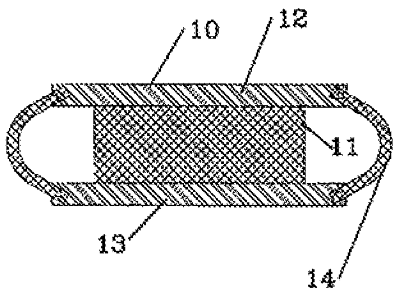


Fig. 1

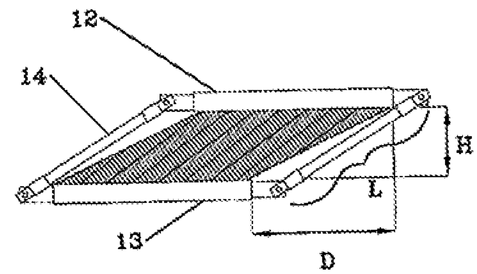


Fig. 5

Moreover, the tension damping devices 14 are described in the Holland et al patent as the component which causes the bearing device to have an ultimate translational length (in the horizontal direction) and capacity for supporting an upper structure on a lower structure. The Abstract of the Holland et al Patent concisely describes the structure and function depicted in Figs. 1 and 5 above:

> The … invention is directed to a seismic isolation bearing having an ultimate translational distance and capacity for supporting an upper structure on a lower structure, comprising a load bearing core (11) for absorbing forces which cause a horizontal sliding movement between the upper structure and the lower structure, an upper load bearing plate (12) positioned on top of the uppermost load bearing body and a lower load bearing plate (13) positioned beneath the lowermost load bearing body. The bearing further includes a tension damping device (14) comprising a matrix material and a reinforcement material disposed therewithin and having an activation point and range. Each tension damping device (14) is adapted to be connected between the upper load bearing plate (12) and the lower load bearing plate (13) for damping and stiffening the sliding movement between the upper and lower structures. (emphasis and numerical call-outs added)

As a preface to the disclosure, the background portion of the patent points out the problem to which the Holland et al invention was directed:

“Translation type isolation bearings, or bearings that are relatively rigid in one direction and relatively flexible in the two orthogonal directions, consist of at least a core of horizontally sliding or translating surfaces or materials that reduce the transmitted vibration energy. At the same time, the core is also capable of carrying the vertical gravity loads of the structure.” (Paragraph beginning at col. 1, line11)

“In the case of seismic isolation bearings, movement at the base of the bearing is associated with earthquake ground motion. The maximum possible translation that might be imposed on the isolation devices is not well understood because there is disagreement on the maximum potential ground motions. .... Therefore, it is considered prudent to guard against unexpected bearing failure, caused by unexpectedly high bearing displacements, that may lead to sudden loss of structure support.” (Paragraph beginning at col. 1, line19)

“At present, control of maximum bearing displacements is accomplished by utilizing a variety of means, including: (1) designing overly stiff bearings; (2) relying on increasing elastomer stiffness with strain; (3) adding hydraulic type dampers or pistons in parallel with the bearings; (4) providing metal chains, cables or rods to stop the bearings; (5) providing auxiliary friction sliding devices that provide increasing friction resistance with bearing translation; and, (6) providing stabilizing columns that "catch" the building if the bearings should fail.” (Paragraph beginning at col. 1, line 34)

“Representative bearings having maximum bearing displacement control include U.S. Pat. Nos. 4,910,930 (Way) and 5,014,474 (Fyfe et al.). Way discloses a seismic isolation structure comprised of a high damping elastomeric bearing and a restraint means mounted between a building's footings and support columns. This restraint means is comprised of a curled steel rod located outside the bearing core. Fyfe discloses an apparatus having a low friction elastomeric load bearing pad disposed between an upper and lower load bearing plate and a freely disposed restraining means, such as a steel cable or chain, in an axial bore through the center of an elastomeric bearing and attached to the upper and lower load bearing plates.” (Paragraph beginning at col. 1, line 43)

“Although capable of handling unexpected inputs, conventional displacement controlled bearings do not exhibit an optimized design capable of handling expected inputs. In the case of a displacement controlled seismic isolation bearing, an optimum bearing design would entail one in which structure accelerations are reduced as much as possible for typical, expected ground motions ranging in scale from Richter Magnitude 5 to 7, and

> failure is prevented in extreme, unexpected ground motions, or those greater than Richter Magnitude 8." (Paragraph beginning at col. 1, line 58)

> "Bearings having displacement control, to date, are deficient in their design and function for a number of reasons, including: (1) overly stiff bearing cores reduce isolation effectiveness in the expected input range; (2) elastomer stiffness increase with strain is too slow to prevent displacement bearing failure; (3) hydraulic or similar viscous systems are expensive and overly stiffen the bearing, reducing its effectiveness; (4) friction sliding devices tend to be unreliable because they depend on long-term, consistent stick-slip action at the sliding surfaces and are sensitive to normal or vertical force which varies in a dynamic and complicated way; and (5) steel cables, chains, springs or rods generate a sudden impact load on the structure when they become taut and typically do not return to their initial configuration after becoming taut." (Paragraph beginning at col. 2, line1)

It is clear from this discussion that the problem to be solved is one of limiting the deformation of the seismicly deformable bearing members to less than their maximum permissible limit. The Holland et al patent states that

> "…., it is an object of the present invention to provide an improved seismic isolation bearing capable of being optimized for expected inputs, while at the same time remaining protected from failure caused by the extreme inputs. This effect is achieved through employing a tension damping device that gradually imparts an increased stiffness and damping to the bearing assembly when required, but otherwise does not affect the operational characteristics of the bearing." (col. 2, lines 19 to 27)

The Holland et al invention thus relates to a seismic isolation bearing including "a load bearing core for absorbing forces which cause a horizontal sliding movement" between an upper structure and a lower structure, and one that has an ultimate translational length and capacity for supporting the upper structure and the lower structure. The patent points out that

> "….. The bearing further includes a tension damping device (referred to herein as a TDD) comprised of a matrix material and reinforcing material disposed therewithin and having an activation point and range. Each tension damping device is adapted to be connected between the upper load bearing plate and the lower load bearing plate for damping and

> stiffening the sliding movement between the upper and lower structures. (col. 2, lines 48 to 58)
>
> "….Furthermore, the TDD controls the maximum displacement but does not affect actual bearing behavior prior to becoming active, thus allowing the bearing to be optimized for expected inputs while the gradual stiffening and damping effect may be relied on to prevent bearing failure in unexpected events. (col. 2, lines 49 to 53)

From this description it is clear that the Holland et al tension damping device is not an elastic pipe surrounding a plurality of energy converting systems, nor is it intended to apply a compressive preload across an energy converter system as claimed by Applicant. To the contrary, the TDD is merely a collection of several stretchable strap-like attachments used to limit the permissive deformation of a bearing member, and then provide a degree of damping as the straps reach their un-stretched length. It is significant that the patent states that " the TDD controls the maximum displacement but does not affect actual bearing behavior prior to becoming active", meaning that it plays no roll in the building support function until the bearing device is deformed (by seismic action) so much that it reaches the limit permitted by the lengths of the TDD's. The TDDs then resiliently constrain further deformation of the bearing device rather than abruptly halting it as would be the case if chains or steel rods were used for this purpose. There are thus clear structural and functional distinctions between the Holland et al disclosure and Applicant's claimed invention. If the TDD's of Holland et al were to be used to apply a preload on the bearing device they would obviously "affect actual bearing behavior".

More specifically, the basic Holland et al invention is illustrated in Fig. 1 is a bearing assembly 10 including

> "…a load bearing core 11 for absorbing forces which causes a horizontal sliding movement between… an upper load bearing plate 12 positioned on the top surface of the load bearing core,… a lower load bearing plate 13 positioned on the bottom surface of the load bearing core,…and …at least two, tension damping devices (TDD) 14 comprised

> of a matrix material and reinforcing material disposed therewithin and having an activation point and range. Each TDD is connected to, and between, upper load bearing body 12 and lower load bearing body 13 by a suitable manner. In the embodiment illustrated therein TTD's exhibit an arcuate shape."

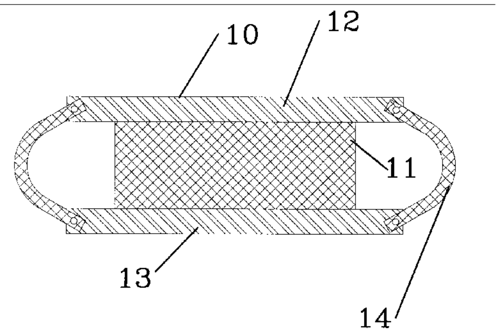


Fig. 1

The specification points out that

> "In general, the TDD's may vary in length, diameter, composition, number, and in their attachment to the bearing core in order to optimize the behavior of a particular isolation bearing."

And that

> "Specifically, any TDD should exhibit a length whereby the activation of the TDD (its activation point) occurs at some point prior to the bearing core reaching it's ultimate translation capacity at which point the bearing core begins to fail or become unstable due to either tearing or buckling. It is at this activation point when the TDD begins providing its characteristic stiffening and damping." (col. 4, lines 7 – 13)

Figs. 2, 3 and 4 of the patent illustrate characteristics of the core 11 and examples of how the TDD's are attached to the bearing plates 12 and 13.

Figs. 5 illustrates how the core will be deformed as the upper plate 12 is translated, i.e., moved horizontally, relative to the bottom plate 13 as a result of a

seismic event, and ultimately reaches a point at which the TDD's 14 are placed in tension to <u>resist further horizontal displacement.</u>

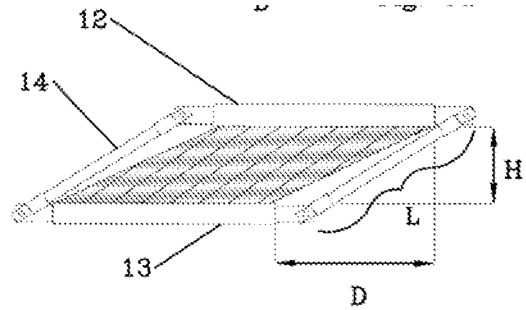
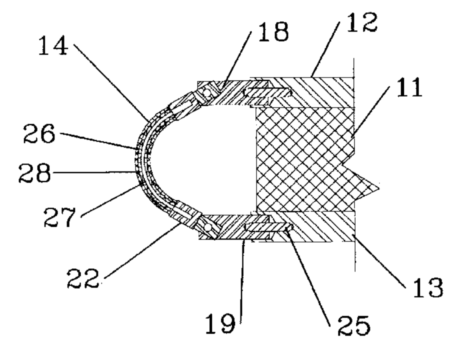


Fig. 5

Fig. 6 illustrates that the TDDs 14 may be tubular in configuration and be reinforced.

> "In one embodiment, <u>the TDD is a cylindrical body</u>; more preferably, a hollow cylindrically body. The cylinder should exhibit <u>an external diameter between about 0.5 inches and 4.0 inches and an inner diameter between about 0.25 inches and 3.5 inches.</u> Referring now to FIG. 6 … TDD 14 is comprised of two hollow cylindrical matrix material bodies 26 and 27 having different diameters and a reinforcing material 28 disposed between an inner circumferential surface 29 of the larger hollow cylinder 26 and the outer circumferential portion 30 of the smaller hollow cylinder 27; see also FIG. 7." (col. 5, lines 45 – 57)

FIG. 6



From the above there can be little doubt that the TDD is a displacement limiting device and not a pretensioning device as recited in Applicant's claims.

Curiously however, following a discussion of the provision of reinforcing for the tubular TDD's beginning in col. 5, line 65, and continuing to col. 6, line 12, the

Holland et al patent makes a naked asertion that is totally out of context, and unsupported with a drawing, to the effect that

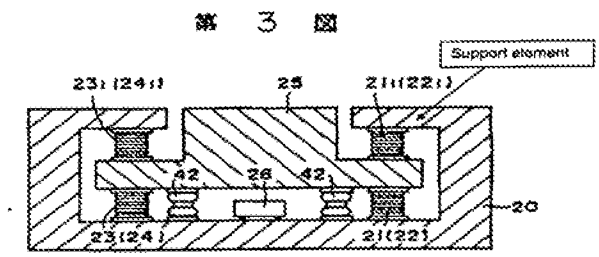
> “In another embodiment of the present invention, the tension damping device may be pre-tensioned during installation so as to exert an initial compressive force on the bearing.“ (col. 6, line 13 -16)

This bald statement is in clear contrast to all previously described embodiments, and does not indicate how such “pre-tensioned” damping device would be connected to the bearing to be effective, or even how the device would be pre-tensioned. Nor does it state a reason for the pre-tensioning. Accordingly, such statement should not be considered as more than an off-hand assertion, particularly in view of the fact that earlier in the patent it is pointed out that apparatus of this type are not concerned with vertical loading of the bearing, and only deal with translation or displacement (of the bearing top relative to its bottom) in the “two orthogonal directions”, a shear issue, not one of compression as in the present application. Note that no further mention of pre-tensioning is made in the patent, and that the statement is immediately followed by a discussion of still two other embodiments, shown in Figs. 8 and 8a, which apparently have nothing to do with pre-tensioning.

Since the entire disclosure of the patent provides no further comment relating to pre-tensioning, and since all previous discussion has dealt solely with limiting horizontal translation of the upper bearing plate 12 relative to the lower bearing plate 13, there is no reason to believe that any such pre-tensioning comment would be intended to apply a compressive force to the bearing in a vertical direction for any apparent reason. Furthermore, it would appear that any pre-tensioning would cause immediate stretching of the TDD’s 14 as the plates 12 and 13 are translated horizontally in an earthquake rather than allowing at least some permissive deformation of the bearing 11 before the TDD’s reach their length limit, damp the deformational motion, and then stop the deformation. It must therefore be concluded that this statement is totally lacking in any teaching

that is relevant to Applicant's invention, and thus fails to suggest, to the artisan skilled in the relevant art, any modification of the Katsumi device that might equate to Applicant's claimed invention.

In conclusion, Applicant presents for comparison in juxtaposed relationship, both of the cited prior art embodiments and Applicant's basic embodiment.



KATSUMI

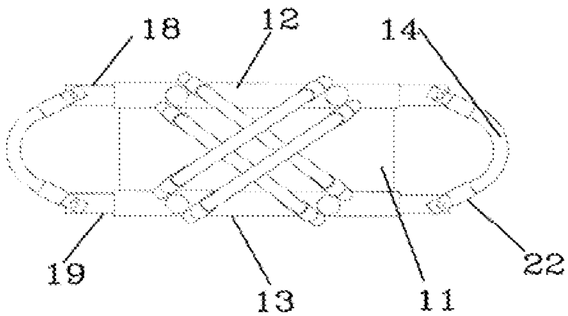
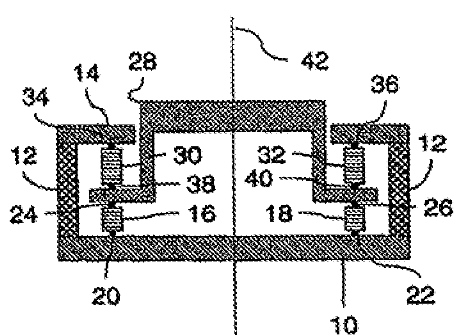


Fig. 8a

HOLLAND ET AL



PRESENT INVENTION

The Office Action states that

> "Holland shows a tension damping device (elastic pipe 14 see column 4 lines 21-27) for a vibration damper in figure 1 in order to provide better damping performance (see abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Katsumi's assembly to comprise an elastic pipe as taught by Holland et at in order to provide further dampening capability to the assembly of Katsumi at the same time protecting the assembly from environmental elements."

Applicant respectfully traverses this conclusion on the grounds that it is clearly in error. The referenced text at column 4, lines 21-27 specifies only that

> "The matrix material employed in the TDD may include any natural and or synthetic rubbers which are capable of being cured or vulcanized utilizing the combination of heat and suitable vulcanizing agents and which exhibit characteristic properties which will make it suitable for use as a tension damping device in an isolation bearing application. (col. 4, lines 21 - 27)"

This text only mentions characteristics of material that might be used in a TDD. It does not teach a relevant use of a TDD. A more revealing portion of the text is found at col. 5, lines 44 et seq, viz.,

> "In one embodiment, the TDD is a cylindrical body; more preferably, a hollow cylindrically body. <u>The cylinder should exhibit an external diameter between about 0.5 inches and 4.0 inches and an inner diameter between about 0.25 inches and 3.5 inches.</u> Referring now to FIG. 6 illustrated therein is a partial view of a seismic isolation bearing 10 having attached thereto another embodiment of a hollow cylindrical body shaped TDD. TDD 14 is comprised of two hollow cylindrical matrix material bodies 26 and 27 having different diameters and a reinforcing material 28 disposed between an inner circumferential surface 29 of the larger hollow cylinder 26 and the outer circumferential portion 30 of the smaller hollow cylinder 27; see also FIG. 7. "

This text indicates that the TDD's are hollow cylindrical bodies having an inner diameter of between 0.25 inch and 3.5 inches, hardly large enough to envelope any building support bearing device.

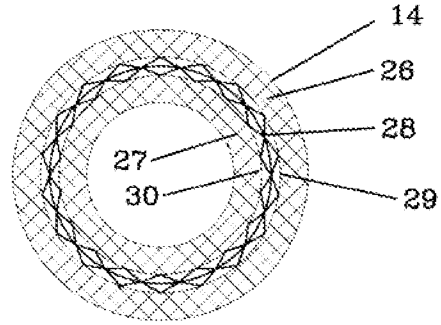


Fig. 7

Holland et al do not suggest the use of a single cylindrical tension damping means surrounding and enclosing their bearing member 11. In fact the only form of “tension damping device” (TDD) disclosed or suggested by the patent is the rod-like or tubular strap-like member 14 of which a plurality thereof are connected between a load supporting top plate 12 and a bottom plate 13 as shown in Figs. 8 and 8a.

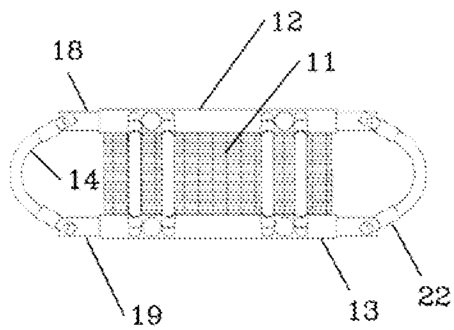


Fig. 8

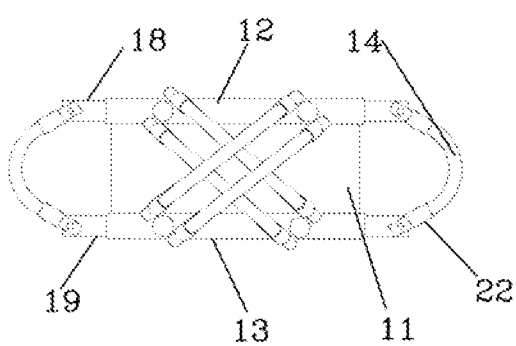


Fig. 8a

Katsumi uses a rigid connection (upstanding part of element 20) between his base (lower part of element 20) and the part (upper part of element 20) that might be considered similar to Applicant's recited "support element". Katsumi's "load" is applied to a "load connection element" 25 and transmitted to the bottom of the structure 20 via a first set of "actuators" 21(22) and 23(24) and to the upper part of element 20 through a second set of "actuators" 21(22) and 23(24).

Applying the Holland et al concept to Katsumi would only result in an attempt to use a plurality of TDD's to connect Katsumi's load carrying member 25 to his base 10, and thereby result in a completely different, improbable and probably inoperable design. There is not even the barest of suggestion in the Holland et al patent as to how or why one would modify the Katsumi "support structure" so that a plurality of the TDD's 14 of Holland et al could be used to apply a compressive preload across even one set of the Katsumi actuators, much less across both sets as recited in Applicant's claims.

Applicant further reiterates that nowhere in any of the references is there any showing or suggestion of Applicant's claimed use of an elastic pipe as a means to provide both structural support for and compressive preload on opposing sets of energy conversion devices, or that the recited combination of elements is either trivial or obvious. Applicant is thus entitled to allowance of the claims.

The Holland et al disclosure teaches the skilled artisan how to build a seismic bearing assembly wherein an upper plate 12 is supported by a bearing 11 which rests on a lower plate 13. The upper plate 12 and lower plate 13 are connected by a plurality of elongated and folded tubular connectors 14 which are intended to limit the lateral deformation of the bearing 11. If one were to follow even the naked statement made in the above quoted paragraph, and put the TDD's 14 in tension, it would still not teach one knowledgible of Katsumi how he could or should apply such tension applying elements across the actuators 21(22) and

23(24). There is thus no legitimate combination of Katsumi and Holland et al that would lead one skilled in this art to Applicant's claimed invention in which

> "at least one elastic pretensioning device connect(s) said base connection element to said support element for exerting a compressive preload on (a) first energy converter system and on (a) second energy converter system, said pretensioning device being embodied as an elastic pipe which surrounds the energy converter systems"

Applicant therefore respectfully submits that there is no basis whatsoever for any combination of the teachings of Katsumi and Holland et al, and that the rejection of the claims is therefore in error.

Accordingly, reconsideration of the rejection and an early Notice of Allowance is respectfully solicited. In the event that the Examiner should remain adamant in maintaining the rejection, Applicant requests the courtesy of a prompt notice thereof so that a Notice of Appeal can be timely filed.

Respectfully submitted,

Date: June 30, 2009

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